Results: A total of 76 patients (61±15 years, 35 male/41 female) had a mean BNP (pg/ml) of 2766± 1398 (SD) of whom 50 (66%) had LVEF >40 and only 17 (22%) had VOL. All patients had a recent history of cancer- 34 (45%) had a hematological malignancy and 42 (55%) had a solid tumor. 43 patients (57%) had evidence of sepsis. Of these 43 patients, 40 did not have VOL and 35 had LVEF>40. The BNP values, although all elevated, were higher in VOL (3463±1439, n=17) versus NO VOL (2565±1332, n=59) p<0.05. Similarly, BNP values were higher if LVEF<40 (3273±1474, n=26) versus LVEF>40 (2502±1294, n=50), p<0.05 by ANOVA.
Conclusion: Markedly elevated BNP values obtained on cancer patients admitted with multiple co-morbidities may not reliably indicate VOL or reflect LV dysfunction. In patients with cancer and infectious complications, therapeutic decisions may need to be guided more by clinical evidence as opposed to laboratory evidence of HF or VOL. It is possible that other factors, such as IL-6 or other cytokines, may stimulate BNP release in the absence of significant VOL or perhaps interfere with the standard assay giving erroneously high values.

1049-117 B-Type Natriuretic Peptide Is a Biochemical Predictor of Myocardial Contractile Reserve During Dobutamine Stress Echocardiogram

Ann Tong, Daniel Lenihan, Vivjay Divakaran, Jessica M. Tristan, Mona Nemer, Joseph Swafford, Gregory Geisler, Mary Vooletich, Beverly Handy, Jean-Bernard Durand, University of Texas, M.D. Anderson Cancer Center, Houston, TX

Dobutamine Stress Echocardiography (DSE) is used to assess myocardial contractile reserve (CR) in ischemic and dilated cardiomyopathy (CMP). A higher CR is associated with improved prognosis and LVEF with optimal therapy. No data is available in patients with chemotherapy-induced CMP. Technical limitations due to imaging may reduce the diagnostic ability of DSE. Brain Natriuretic Peptide (BNP), a neurohormone secreted from the ventricle in response to volume overload, may provide additional predictive power to DSE.
We hypothesized that BNP can be used as a biochemical marker for CR and may improve diagnostic capability of DSE. BNP levels were obtained at baseline and peak infusion during DSE in 42 patients (23 men, 19 women) with LVEF < 45%. Baseline demographics: mean age 61±14 yrs, prior chemotherapy 67%, ischemic heart disease 34%, hypertension 36%, diabetes 12%, and NYHA class 2.3±0.9. Patients were categorized based on response of BNP during DSE: Group 1 (n=22, BNP falls) and Group 2 (n=20, BNP rises). See Table 1. With linear regression analysis, there was a significant inverse correlation between changes in BNP and LVEF pre and post DSE (r=0.6, p<0.001).

Table 1

	Change in BNP(pg/ml)	Pre-DSE LVEF(%)	Post-DSE LVEF (%)	Change in LVEF(%)*
Group 1 (fall in BNP)	-110±90	35±9	49±11	14±5
Group 2 (rise in BNP)	68±84	33±9	38±12	4±8

all data is mean ± SD
* change in LVEF inversely correlates with change in BNP, <0.001

BNP can identify CR in conjunction with DSE and may be helpful in technically difficult studies. A decrease in BNP after DSE is strongly correlated with the presence of CR as shown by an increase in LVEF. In chemotherapy-induced CMP, a condition generally considered irreversible, BNP in conjunction with DSE may predict improvement of cardiac function.

1049-118 N-Terminal Pro-Brain Natriuretic Peptide and Urinary Albumin Excretion Is Independent Predictors of All Cause Mortality in the General Population

Caroline Kistorp, Ilan Raymond, Frants Pedersen, Jens Faber, Per Hildebrandt, Frederiksberg University Hospital, Frederiksberg, Denmark

Background: N-terminal proBNP (NT-proBNP) and urinary albumin excretion is known important risk factors for mortality in patients with chronic heart failure (CHF) and diabetes mellitus, respectively. It is unclear whether these unconventional risk factors are independent predictors of all cause mortality in the general population.
Methods: A total of 658 subjects (age 51-91 years), were consecutively recruited from 4 general practitioners in the Frederiksberg municipality. All subjects underwent echocardiography, measuring left ventricular ejection fraction (LVEF), and plasma NT-proBNP and urinary albumin/creatinine ratio (A/C ratio) were measured at baseline. Mean follow-up time was 48 months. Using multivariate Cox proportional hazard models, the prognostic value of the upper quartile of plasma NT-proBNP and urinary A/C ratio was evaluated in two models: Model 1 (total population). Model 2 (after exclusion of patients with known heart failure or LVEF <=50 %, as well as, diabetes by history or HbA1c >= 6.1 %).
Results: During follow-up there were 55 (8.4 %) deaths from any cause in the total population (n = 658). Plasma levels of NT-proBNP and urinary A/C ratio in the upper quartile, was associated with increased risk for total mortality. For NT-proBNP, hazard ratio (HR) was 3.6 (95% CI: 1.6-6.7, p < 0.0001); for urinary A/C ratio, HR was 2.6 (95% CI: 1.4-4.9, p=0.002). In model 2 (n = 495) mortality rates were 5.3 %. For NT-proBNP, HR was 2.8 (95% CI: 1.3-6.2, p=0.009); for urinary A/C ratio, HR was 5.1 (95% CI: 1.8-13.9, p=0.0019), after adjustment for age, gender, LVEF and established risk factors in both models. Median urinary A/C ratio (mg/g) and plasma NT-proBNP (pmol/l) levels in subjects who died was 20 mg/g (4-274), and 94.0 pmol/l (18.3-1633.2), compared with 6 mg/g (3-66) and 30.1 pmol/l (5.2-202.6) in survivors, p < 0.0001 for both.
Conclusion: Plasma NT-proBNP and urinary albumin are independent risk factors for total mortality in the general population. Even when excluding patients with conditions associated with increased plasma NT-proBNP and urinary albumin excretion, both unconventional risk factors remained strong prognostic predictors.

POSTER SESSION

1050 Cardiogenic Shock and Assist Devices: New Insights

Sunday, March 07, 2004, 3:00 p.m.-5:00 p.m.
Morial Convention Center, Hall G
Presentation Hour: 4:00 p.m.-5:00 p.m.

1050-120 Echocardiographic and Angiographic Correlations in Cardiogenic Shock

M. Joshua Berkowitz, Shannon Harkness, Judith Hochman, Michael Picard, Timothy Sanborn, Norma Keller, James Slater, New York University Hospital, New York, NY

Objectives: We investigated the correlation between echocardiographic and angiographic core lab data in patients with cardiogenic shock (CS) complicating AMI.
Background: In patients with CS complicating AMI, both echocardiographic and angiographic findings are used to aid diagnosis, determine prognosis, and guide management. The purpose of this study of the SHOCK trial is to identify relationships between the angiographic and echocardiographic features of patients with CS. Such an analysis may provide insights into the etiology and treatment of CS.
Methods/Results: Of 302 randomized patients, a pre-revascularization echocardiogram and angiogram was available in 119 patients. The correlations between almost all echo and angiographic parameters collected within 4 hours and greater than 4 hours of each other were similar. Although the median ejection fraction (EF) derived by echo and LV angiogram was identical, 29.5%, this significant positive correlation was weak (R^2=.209, p=.019) as was the significant negative correlation between EF and angiographic jeopardy scores (R^2=.145, p=.001). Although the presence of left main obstruction (>50% stenosis) was associated with lower LVEF (26% vs.31%, p= .031) there was only a trend for decreasing EF with number of diseased vessels. Patients with a higher number of diseased vessels had worse MR by echo (p=.005). There was a significant but weak association between LV gram MR grade and echo MR severity (R^2=.162, p=.015), but there was no association between culprit vessel and degree of MR. Patients with TIMI grade 0/1 were more likely to have impaired LV function (p=.029). Collateral flow to the culprit vessel was not associated with improved EF. There was a trend towards an increased incidence of LV thrombus in LAD culprit vessels (p=.060).
Conclusions: Higher angiographic jeopardy scores and low TIMI flow scores are associated with worse LV function but collateral flow to the culprit vessel is not associated with improved EF by echo. Worse CAD is associated with more severe MR. Both echo and angiography are valuable and result in similar estimated EF's in a large cohort however there is wide variation between the techniques in individual patients.

1050-121 Echocardiographic, Electrophysiological, Histological, and Serological Recovery During Left Ventricular Assist Device Support

Steve Xydas, Jason Cohen, Yoshifumi Naka, Donna M. Mancini, Marco DiTullio, Amanda D. Arnold, Chuck Ng, Mehmet C. Oz, Simon Maybaum, Columbia University College of Physicians and Surgeons, New York, NY

Background: Mechanical unloading during left ventricular assist device (LVAD) support may lead to cardiac recovery, however, clinical markers of recovery have yet to be identified. We sought to define the echocardiographic (echo), EKG, serological and histological changes during device support.
Methods: LVAD patients underwent monthly evaluation, including echo, EKG and serum BNP measurement. Paired myocardial tissue samples from implant and explant were analyzed.
Results: 32 LVAD patients were prospectively followed. Duration of heart failure was 47.3 ± 99.1 months and duration of support was 103.2 ± 85 days. Left ventricular ejection fraction (LVEF) and end-diastolic diameter significantly improved at 30 days as compared to pre-LVAD, with no further improvement with longer periods of support. At 30 and 60 days, QTc and QRS were significantly decreased from pre-LVAD. There was a marked reduction in BNP, myocyte size, and collagen deposition during LVAD support. In screening for markers of recovery, the decrease in QTc correlated with LVEF at 30 days (R = -0.993, p < .01). Interestingly, changes in QRS correlated with the drop in myocardial collagen deposition (R = -0.976, p < .01). No study patients had sufficient recovery for device explantation.
Conclusions: We demonstrate echo, EKG, histologic, and serological improvement during LVAD support. Recovery is evident at 30 days and is sustained through 90 days of support. Further prospective data collection may yield important markers of recovery.

	Implantation	30 days Post-Implantation	60 days Post-Implantation	90 days Post-Implantation	Explantation
Echocardiographic Analysis:					
LVEF (%)	19.3±6.62	43.5±8.51***	40.7±10.9***	36.0±12.7***	-
LVEDD (mmHg)	6.94±1.40	3.31±0.97***	4.42±1.00***	4.90±1.40**	-
LV mass (gm)	-	193±102	192±90.1	220±90.1	-
Tissue Analysis:					
Myocyte Area (μm^2)	562±122	-	-	-	290±63.3***
Myocyte Diameter (μm)	16.9±2.49	-	-	-	13.0±1.87***
% Collagen Deposition	35.7±7.14	-	-	-	27.1±4.27***
Serological Analysis:					
BNP levels (pg/mL)	225±148	63.8±42.7*	-	-	16.3±7.71**
Electrophysiologic Analysis:					
QTc (msec)	472±56.0	448±48.1	434±34.5*	-	461±70.0
QRS (msec)	121±30.4	104±20.3**	104±17.4**	-	114±45.4
Notes: Values are the means ± SD of the listed parameters.	All p-values are for t-tests vs values at implantation.	* p-value < 0.05.	**p-value < 0.01.	***p-value < 0.001.	

1050-122 Outcomes With Patients of Variable Body Surface Area and Long-Term Use of the DeBakey Ventricular Assist Device®

Edward Teitel, Marco Turina, Roland Hetzer, George Noon, Hans Scheld, Ettore Vitali, Ernst Wolner, MicroMed Technology, Inc., Houston, TX

Background: Ventricular assist devices (VADs) are now accepted treatment for end-stage heart failure as bridge-to-transplant.Based on the REMATCH trial, the HeartMate® device has been approved by the FDA for destination therapy. New generation devices offer the hope for smaller, more reliable support as we move to new indications such as destination therapy. The miniaturized, continuous flow DeBakey VAD® has been the most widely used new generation VAD, with over 200 implants worldwide.
Methods: The clinical report forms for completed patients and notes from weekly patient monitoring conferences for ongoing patients were examined on 157 patients at 6 sites in Europe.
Results: At pump speeds ranging from 8-11,500rpm (mean 9600 rpm) regardless of BSA, pump output (mean 4.5 l/min) increased with increasing BSA (slope 1.77)($p < 0.001$). Mean arterial pressures and end organ function, as indicated by BUN, creatinine, and total bilirubin remained in the normal range regardless of BSA. Twenty-five patients were supported > 6 months and 6 patients were supported > 1 year. Of the 25 who were supported > 6 months, 16 (64%) went on to transplant, 2 (8%) are still on support, and 7 (28%) died. Five of the patients on support over a year were transplanted and one died. Forty-three were discharged for a total of 3821 discharge days, or 10.46 patient-years. (2-342 days). (Some patients were not eligible for discharge because of institutional or regulatory constraints.) Twenty-five patients had 50 hospital readmissions. These readmitted patients spent 2974 days out of the hospital (8.15 patient-years). 70% of those discharged, were either transplanted or remain well on long-term support at home.
Conclusion: The DeBakey VAD adequately supports patients from 1.2-2.3 m^2 BSA. DeBakey VAD patients on long-term support can be successfully managed at home with excellent outcomes.

1050-123 Neurological Events With a Totally Implantable Left Ventricular Assist System: The European LionHeart Clinical Utility Baseline Study (CUBS)

John P. Boehmer, Walter E. Pae, Jr., R. Koerfer, A. El-Banayosy, R. Hetzer, M. Vigano, A. Pavie, Penn State Milton S. Hershey Medical Center, Hershey, PA, Bad Oeynhausen Heart Center, Bad Oeynhausen, Germany

We recorded neurological events in patients with end-stage heart failure not eligible for transplant undergoing left ventricular assist device (LVAD) placement with the totally implantable pulsatile LionHeart LVAS as alterntive to medical therapy (AMT).
Twenty-three patients underwent implantation of the LVAS in a non-randomized, observational study. Neurologic events were pre-specified as a class of adverse events, reported by sites, and adjudicated independently. The events were further sub-classified as stroke (CVA), transient ischemic attack (TIA), intracranial bleed (ICB), or other (e.g., brain abscess), and whether they were either permanent/disabling or transient/reversible.
there were 24 neurologic events in 13 patients (56.5%). Nine patients experienced either ICB or CVA, five of which also had a TIA. There were a total of 12 TIAs occuring in eight patients, five of who also had either an ICB or CVA. Three patients were reported to have an "other" neurologic event. A total of 11 patients had either a CVA or a TIA as a primary event, producing an event rate of 0.69 events per pateint-year of follow-up. Placed in terms of functional outcomes, 8 of the LVAD patients had a permanent/disabling neurological injury and 7 had a transient/reversible episode. Importantly, at least 1/3 of events (8/24) occuring in four patients were preventable with improved patient selection and management.
Neurologic events constitute a significant portion of adverse outcomes in this population of AMT following LVAD placement. TIA is the most common neurologic event, with 12 events occuring in eight patients. The incidence is similar to that of the REMATCH LVAD group where 52.9% of patients had neurological dysfunction and 21% were reported to have experienced either an ICB or at least one TIA. Improvements in device design and patient selection as well as management will be needed to reduce the risk of neurologic events in patients supported with LVADs as AMT.

1050-124 Left Ventricular Ejecting Force of the Intra-Aortic Balloon Pump Assisted and Nonassisted Beats

Ashraf W. Khir, Michael Y. Henein, Derek G. Gibson, John R. Pepper, Royal Brompton Hospital, London, United Kingdom, Brunel University, Uxbridge, United Kingdom

Background: The benefits of the Intra Aortic Balloon Pump (IABP) have been widely demonstrated, but the underlying mechanisms of these benefits are not fully described. The left ventricle (LV) ejects the stroke volume with a force that is equal to blood mass multiplied by its acceleration.
Methods: Aortic root, LV early diastolic filling (E-wave) and left anterior descending coronary (LAD) flow velocities were recorded in 20 patients requiring IABP in the intensive care unit using transesophageal Doppler echocardiography. Recordings were made at pumping rates 1:2 and 1:3, leaving a minimum of 15 minutes between recordings to allow for the return to control state. Flow acceleration at the aortic root was calculated as the slope of the early part of the velocity curve and velocity time integral (VTI) was calculated to indicate stroke volume. Diastolic VTI of LAD and LV E-wave velocity curves were also calculated to indicate LAD and LV filling flow.
Results: LAD peak diastolic flow velocity and its VTI increased significantly at IABP 1:2 by (22±2%), (79±15%), and 1:3 by (17±2%), (67±10%) respectively, compared to non assisted beats. LV E-wave peak velocity and its VTI increased significantly at IABP 1:2 by (20±5%), (75±6%), and 1:3 by (11±4%), (60±4%) respectively, compared to non assisted beats. Although a change in flow acceleration at the aortic root was not observed between the assisted and non assisted beats, peak velocity and VTI increased significantly at IABP 1:2 by (25±4%), (35±5%) and 1:3 by (20±3%), (25±4%) respectively, compared to non assisted beats. The increase in LAD diastolic VTI correlated with the increase in diastolic E-wave VTI (r = 0.82), which correlated with the increase in aortic root systolic VTI (r=0.87).
Conclusion: The increase in LAD diastolic flow due to balloon inflation results in an increase in LV filling flow. The increase in LV filling augments the stroke volume ejected into the aorta, which is in agreement with Starling law. The increase in the stroke volume despite the unchanged aortic flow acceleration suggests an increase in the LV ejecting force of the assisted beats, elucidating one of the benefit of IABP.

1050-125 Clinical Application of a Wear-Resistant Axial Flow Pump With an Intelligent Control Algorithm as a Left Ventricular Cardiac Assist Device

Johannes Mueller, Yu-Guo Weng, Torsten Drews, Dagmar Kemper, Evgeni Potapov, Michael Jurmann, Roland Hetzer, Deutsches Herzentrum Berlin, Berlin, Germany

Background: Since the early application of assist devices it has been a goal to have a totally wear-resistant system. INCOR, an axial flow pump for left heart support, has a virtually unlimited life due to magnetic suspension of the rotating impeller. Patients with axial flow pumps show a reduced pulsatility of the blood flow. In order to avoid significant arrhythmia due to sucking in of myocardial tissue INCOR is implemented with an anti-suction control algorithm.
Methods: Out of 72 patients supported with the device since June 2002, 31 (1f, 30m; mean age 53, range 36–65 years) with end-stage heart failure received the system in this institute. Anticoagulation consisted of heparin postoperatively and of Aspirin, clopidogrel, and Warfarin later on. For dosage adjustment, INR, thrombelastography and platelet aggregometry were performed. Furthermore, anti-heart-failure medication was administered.
Results: Mean follow-up is 127 (range, 12-454) days; 19 patients are still being supported. Two patients could be weaned because of cardiac improvement after 178 and 206 days. Two were transplanted and eight died due to multi-organ failure after a mean of 49 (range 22 – 126) days. Three patients showed signs of a transitory ischemic attack and two had cerebral bleeding. Due to the implemented anti-suction algorithm suction did not occur in any patient. After 2 months, blood chemistry showed normal values for all organ functions, in particular no hemolysis (LDH, LDH1 normal) and no deviation of any blood cell count. None of the patients showed signs of infection (CRP normal). Auto-antibodies against cardiac structures like the beta-1-adrenoceptor disappeared within six weeks after the implantation.
Conclusions: Application of up-to-date technology in the design of axial flow pumps significantly improves the clinical outcome. Especially the problems resulting from chronic systemic infection and elevated inflammatory status, known as a major problem of cardiac assist device therapy, seem to be solved. The disappearance of the antibodies after only six weeks is a sign of a fast immunological recovery. No side effects due to reduced pulsatility of the blood could be observed.

1050-126 Left Ventricular Assist Device Implantation in Patients With Viral Myocarditis-Induced Heart Failure

Nicholas C. Dang, Ranjit John, Jeffrey A. Morgan, Brian J. Lee, Mehmet C. Oz, Yoshifumi Naka, Columbia-Presbyterian Medical Center, New York, NY

Background: Viral myocarditis (VM) is a disease entity that exhibits a broad range of clinical pathways to the onset of cardiac symptoms, but the progression to severe congestive heart failure, both chronic and acute, carries significant morbidity and mortality. Left ventricular assist device (LVAD) implantation has gained acceptance as a modality